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*Wine*

ECONOMICS  
INFORMATION  
REPORT



ECONOMIC OPPORTUNITIES FOR  
PROFITABLE WINERY OPERATIONS  
IN NORTH CAROLINA

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# **ECONOMIC OPPORTUNITIES FOR PROFITABLE WINERY OPERATIONS IN NORTH CAROLINA**

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## ABSTRACT

The purpose of this report is to present information useful to grape growers and potential investors interested in constructing and operating wineries in North Carolina. The specific information relates to construction and operating costs and the profitability of processing grapes into wine in selected winery sizes. Data required to estimate costs and profitability were obtained from existing wineries, equipment manufacturers and published reports.

Three basic winery operations were selected for detailed analysis. Output and product mix are varied for each of the three wineries. The three basic output levels of the three wineries are 20, 100 and 500 thousand gallons. Blending of bulk wines is used to generate three operating options.

Actual costs of producing wines under assumed conditions ranged from \$1.05 per fifth of pure scuppernong wine for the small winery to 88 cents per fifth for the medium and large wineries. Blending with bulk wines to double output lowered costs by 26 cents per fifth in the small winery but only 13 cents per fifth in the large winery. The medium winery operated at lower costs resulting from economies of size relative to the small winery and from tax advantages relative to the large winery. The out-of-state tax schedule was important in determining the costs and profitability of the three wineries.

Internal rates of return were calculated at alternative wine prices. Rates of return above 10 percent (current cost of capital) were obtained for very selected operating conditions and the higher wine prices. It was not possible to determine if these wines could be marketed at the higher wine prices. Further analysis is needed in this area.

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# ECONOMIC OPPORTUNITIES FOR PROFITABLE WINERY OPERATIONS IN NORTH CAROLINA

## INTRODUCTION

Wine production offers grape growers one market outlet for their raw product. This option has been elected during the last several years by most muscadine grape growers. Production of muscadine grapes in North Carolina had grown to an annual volume of around 2,200 tons in 1975.<sup>1</sup> Out-of-state wineries have shown less interest in purchasing the current level of production although the price has declined over the last two seasons. Anyway, grapes are expensive to transport for long distances because of their bulky and perishable characteristics. The quality of the fruit is also difficult to maintain at satisfactory levels for wine-making if the fruit is not processed shortly after harvest.

Other reasons, many of which are economic, have stimulated interest in constructing a winery in the grape-growing region. The prospects are probably good for stimulating demand for in-state consumption. This would permit a winery located in North Carolina to take advantage of the protective or discriminatory tax on the sales of in-state produced wine.

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<sup>1</sup>North Carolina Agricultural Statistics, 1975-76 Annual Issue, Number 131, July 1976, North Carolina Department of Agriculture, Raleigh, N. C.

The advantages of exercising control of product quality and the benefits derived from product image and brand recognition also have stimulated interest in developing local wine processing.

The objective of this study is to provide information about the profitability of processing grapes into wine in selected sizes of wineries. Specifically, the study will provide the following information:

- (1) Technical input/output data for three specific winery capacities.
- (2) Investment capital requirements and overhead and operating costs of these wineries.
- (3) Potential consumption possibilities for the finished product.
- (4) Revenues generated from wine sales and rates of return to capital.

These data can be used by the grape industry in assessing the opportunities of grape production for the wine market and the profitability of wine-making. The expected rates of return to capital can provide information to the potential investor for comparing a wine operation to other potential investment opportunities.

#### PROCEDURE

The economic-engineering approach was used to develop cost relationships for model wineries of various sizes. Data for generating cost relationships were obtained from winery operators and equipment manufacturers. Costs are estimated in terms of in-winery overhead and operating costs, transportation costs associated with moving the wine from winery to wine distributor, wholesale, distribution costs and retailing costs.

The data were analyzed first by the use of the accounting approach. Second, the capitalization approach was used to discount expected future income streams to calculate rates of return to investment capital. Both approaches are described in later sections. Market share analysis was used to estimate the consumption potential for wine. The data provided by the Wine Institute were used for this purpose.

## MODEL WINERIES

Three winery sizes are modeled in this study. These wineries are rated by volume of finished product output. All three wineries are relatively small when compared to wineries operating in the more commercial grape-growing areas of California and New York. Yet, they require a relatively large capital stock to build and operate when compared to the capital stock currently invested in grape vineyards.

The small unit is designed to produce 20,000 gallons of wine from muscadine grapes received during the relatively short harvest season. There are three likely options which an investor or operator might consider for this plant. These alterations would not greatly change the basic design of the winery. Option C would require a slight modification of winery design in that additional tanks for storage and mixing are required. The three options which involved using bulk wine of non-muscadine origin are shown below:

Options for small winery	Output in 1,000 gallons of	
	Pure muscadine wine	Blended wine
A	20	0
B	10	10
C	20	20

The blending mixture used in this study is 50 percent which approximates the legal limits for labeling purposes. Blending wines may be practical as a cost reducer technique or as a method of improving product quality. Bulk wine from other states is often less costly than an equivalent amount of wine made from the muscadine grape. Blending of muscadine wine products produced in two or more seasons is also possible but is not considered in this study.

The second winery is a medium size winery designed to produce 100,000 gallons of wine. The three options evaluated for the medium size winery are as shown below.



Options for medium winery	Output in 1,000 gallons of	
	Pure muscadine wine	Blended wine
A	100	0
B	50	50
C	100	100

The largest winery considered is a 500,000 gallon winery. The three options for the large winery again are the equivalent to the two smaller units. The volumes produced in each option are as follows:

Options for large winery	Output in 1,000 gallons of	
	Pure muscadine wine	Blended wine
A	500	0
B	250	250
C	500	500

## RESULTS OF ANALYSIS

### Cost Analysis Using the Accounting Approach

This section presents the resource requirements, resource prices and costs of in-plant production, transportation, distribution and retail. The analysis is presented by size of winery beginning with the small winery and its potential options.

#### Small Winery

##### Option A

The summary of input requirements, prices and costs for the 20,000 pure muscadine wine Option (A) is shown in Table 1. Initial investment

Table 1. Estimated resource requirements and costs of producing pure muscadine wine in a 20,000 gallon winery (small winery - Option A)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes (180 gal./ton)	111 tons	200	22,500	.222
Bottles	100,000	.21 (printed carton)	21,000	.210
Bottle closures	100,000	.06 (capsules)	6,000	.060
Labels	100	.005	500	.005
<u>Labor</u>				
Winemaker			12,000	.120
Part-time labor			5,000	.050
Bookkeeping, office			4,000	.040
			<u>21,000</u>	<u>.210</u>
<u>Excise taxes</u>				
Federal	17¢ per gal.		3,400	.034
North Carolina	5¢ per gal.		1,000	.010
			<u>4,400</u>	<u>.044</u>
Sugar	24,000 lbs.	.20	4,800	.048
Yeast	Yeast culture		100	.001
Utilities	\$100 per month		1,200	.012
Advertising and promotion			2,000	.020
Miscellaneous (chemicals, filter pads, etc.)			<u>500</u>	<u>.005</u>
Total operating costs			84,000	.840

01 Table 1 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$ 71,000 at 15 years	4,733	.047
Building	43,000 at 20 years	2,150	.022
Land	10,000	0	0
Subtotal	\$124,000	6,883	.069
Taxes	100% evaluation with tax rate of \$1 per \$100 value	1,240	.012
Insurance	1/2% equipment and building value	570	.006
Repairs and maintenance	2% equipment and building	2,280	.023
Interest			
Plant and equipment	5% of capital outlay	6,200	.062
Wine inventory	5% of total operating cost	4,200	.042
Total interest costs		10,400	.104
Total overhead costs		21,373	.214
Total operating and overhead costs		105,373	1.054

costs amounted to \$124,000 which include land, building and equipment. The building was considered to be of new construction from materials which would meet state and federal building codes and regulations. The building was equipped with new stainless steel tanks. Major equipment items along with land and building costs for the small winery are shown in Table 2. The life of the building was set at 20 years but only 15 years for the equipment. Land value was projected to appreciate over time. A 5 percent land appreciation rate was assumed to be reasonable to offset inflation costs.

The conversion rate of 180 gallons of wine per ton of muscadine grapes was assumed.<sup>2</sup> At this rate, 111 tons of grapes per season were required. At \$200 per ton, the costs of the raw product totaled almost 23 cents per fifth gallon. The bottle, closure and label contributed another 27 cents per fifth gallon. Labor costs including a winemaker totaled another 21 cents per fifth gallon. Advertising and promotion costs were estimated at 2 cents per fifth.<sup>3</sup> These plus the miscellaneous cost items totaled 84 cents per fifth gallon.

Annual overhead costs, comprised mainly of annual depreciation and interest, totaled 21 cents per fifth gallon. Interest costs were calculated on the basis of 5 percent of total amount of capital resources used during the period. This is equivalent to 10 percent interest on the amount of capital used during 6 months of the year. The amount of capital tied up in product inventory was based on variable costs rather than the total product value.

Total operating and overhead costs for the 100,000 fifth gallons totaled \$1.05 per fifth. This represents the at-winery costs. In a later section, transportation, distribution and retail costs will be added to this base to derive a minimum consumer price.

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<sup>2</sup>This is the maximum yield of pure juice per ton of muscadine grapes obtained in experimental pressings. It may be possible to get higher yields with larger commercial presses and a moderate amount of amelioration.

<sup>3</sup>National advertising expenditures for all wine shipped in 1975 were estimated at 3.2 cents per fifth (see Impact, Volume 6, November 17, July 15, 1976).

Table 2. Summary of equipment requirements for the small winery

Item	Size or capacity	Costs (\$)
<u>Land requirements</u>	2.5 acres	10,000
<u>Building requirements</u>		
Stemming and crushing shed	200 sq. ft.	1,400
Fermenting and tank room	2,000 sq. ft.	20,000
Warehouse and bottling	750 sq. ft.	7,500
Bathroom	74 sq. ft.	1,850
Office	150 sq. ft.	3,750
Tasting and retail sales room	300 sq. ft.	7,500
Air conditioning		<u>1,000</u>
Subtotal		43,000
<u>Equipment requirements<sup>a</sup></u>		
Stemmer crusher (stemmer crusher, motorized 3 tons/hour)		550
Press (double ratch basket press, 2,000 lbs. capacity)		700
Pump for must (2,000 gallons/ hour capacity)		1,750
Transfer hose (200 ft. of 2" hose and fittings)		750
Stainless steel tanks <sup>b</sup>		
Fermenters and storage capacity	21,000 gal.	36,000
Storage and setting	12,000 gal.	<u>28,000</u>
Subtotal		64,000
Filter (filter, model 8.4 40 plates 17.2 sq. ft. of filter surface)		2,350
6 spout bottle filler (syphon bottler 72 cases/hour capacity)		300
Hand corker (floor model 500 bottles/hour capacity)		100
Laboratory equipment		<u>500</u>
Subtotal		71,000
Total land, building and equipment		124,000

<sup>a</sup>Waste disposal equipment is not listed as a requirement. Smaller wineries who properly manage their waste will probably be permitted to use municipal sewer systems.

<sup>b</sup>Additional tank capacity valued at \$20,000 was required to handle Option C when volume was doubled.

### Option B

A summary of resource requirements and costs for the small size winery producing a 50 percent muscadine blended wine is presented in Table 3. Only 56 tons of muscadine grapes were required by this winery. Ten thousand gallons of bulk wine were also required. The cost structure for this winery was similar to the Option A as discussed above except for two items. First, reduction in the costs of muscadine grapes was greater than the added costs of bulk wine. The bulk wine price was set at 60 cents per gallon at-plant. Second, a relatively small reduction was observed in labor costs.

Blending reduced total costs by 8 cents per gallon. This saving would be reduced to zero if costs of bulk wine increased from 60 cents per gallon to \$1.42 per gallon.

### Option C

This option doubled the output of the 20,000 gallon winery by using tanker cars for storage and an additional quantity of tanks for blending. In addition to the reduction in operating costs from blending the less expensive bulk wine, considerable economies were received in labor use and overhead capital (Table 4). Labor costs declined to 12.5 cents per fifth compared to 21.0 and 20.5 cents per fifth for options A and B, respectively. Overhead costs were reduced by almost 4 cents per fifth.

These savings totaled 26 cents over Option A and 17.8 cents over Option B. Of course, marketing costs might be expected to increase which would tend to offset these savings.

Note that alcohol taxes per unit were the same for all three options for the small winery. Federal taxes were calculated on the basis of 17 cents per gallon for wine under 14 percent alcohol. This rate is unaffected by geographic sales. North Carolina tax rate for wines produced and marketed in the state was set at 5 cents per gallon. For wines not produced in North Carolina from North Carolina grapes, the rate was set at 60 cents per gallon. Certain other southeastern

14 Table 3. Estimated resource requirements and costs of producing blended wine in a 20,000 gallon winery (small winery - Option B)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<b>Operating costs</b>				
Grapes	56 tons	200	11,200	.112
Bottles	100,000	.21 (printed carton)	21,000	.210
Bottle closures	100,000	.06 (capsules)	6,000	.060
Labels	100,000	.005	500	.005
<b>Labor</b>				
Winemaker			12,000	.120
Part-time labor			4,500	.045
Bookkeeping, office			<u>4,000</u>	<u>.040</u>
			20,500	.205
<b>Excise taxes</b>				
Federal	17¢ per gal.		3,400	.034
North Carolina	5¢ per gal.		<u>1,000</u>	<u>.010</u>
			4,400	.044
Sugar	24,000 lbs.	.20	2,400	.024
Yeast	Yeast culture		100	.001
Utilities	\$100 per month		1,200	.012
Advertising and promotion			2,000	.020
Miscellaneous (chemicals, filter pads, etc.)			500	.005
Bulk wine	10,000 gal.	.60	<u>6,000</u>	<u>.060</u>
<b>Total operating costs</b>			75,800	.758

Table 3 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$ 71,000 at 15 years	4,733	.047
Building	43,000 at 20 years	2,150	.022
Land	<u>10,000</u>	<u>0</u>	<u>0</u>
Subtotal	\$124,000	6,883	.069
Taxes	100% evaluation with tax rate of \$1 per \$100 value	1,240	.012
Insurance	1/2% equipment and building value	570	.006
Repairs and maintenance	2% equipment and building	2,280	.023
Interest			
Plant and equipment	5% of total capital outlay	6,200	.062
Wine inventory	5% of total operating cost	<u>4,200</u>	<u>.042</u>
Total interest costs		10,400	.104
Total overhead costs		21,373	.214
Total operating and overhead costs		97,173	.972



Table 4. Estimated resource requirements and costs of producing blended wine in a 20,000 gallon winery (small winery - Option C)

Item	Description	Value (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes	111 tons	200	22,500	.113
Bottles	200,000	.21 (printed carton)	42,000	.210
Bottle closures	200,000	.06 (capsules)	12,000	.060
Labels	200,000	.005	1,000	.005
<u>Labor</u>				
Winemaker			12,000	.060
Part-time labor			9,000	.045
Bookkeeping, office			<u>4,000</u>	<u>.020</u>
			25,000	.125
<u>Excise taxes</u>				
Federal	17¢ per gal.		6,800	.034
North Carolina	5¢ per gal.		<u>2,000</u>	<u>.010</u>
			8,800	.044
Sugar	24,000 lbs.	.20	4,800	.024
Yeast	Yeast culture		100	.001
Utilities	\$100 per month		1,200	.006
Advertising and promotion			2,000	.010
Miscellaneous (chemicals, filter pads, etc.)			500	.003
Bulk wine	20,000 gals.	.60	<u>12,000</u>	<u>.060</u>
Total operating costs			131,900	.661

Table 4 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$ 91,000 at 15 years	6,067	.030
Building	43,000 at 20 years	2,150	.011
Land	<u>10,000</u>	<u>0</u>	<u>0</u>
Subtotal	\$144,000	8,217	.041
Taxes	100% evaluation with tax rate of \$1 per \$100 value	1,440	.007
Insurance	1/2% equipment and building value	670	.003
Repairs and maintenance	2% equipment and building	2,680	.013
Interest			
Plant and equipment	5% of capital outlay	7,200	.036
Wine inventory	5% of total operating cost	<u>6,595</u>	<u>.033</u>
Total interest costs		13,795	.069
Total overhead costs		26,802	.133
Total operating and overhead costs		158,702	.794

states have similar discriminatory tax rates.<sup>4</sup> For this winery, it was assumed that total volume would be marketed within the state. In actual practice, however, it may be necessary to ship to surrounding states. Thus, their tax schedules must be used to specify taxes.

### Medium Winery

#### Option A

This winery represents a fivefold increase in volume compared to the small winery discussed above. One would expect some economies in labor and overhead capital use. The costs are summarized in Table 5. A summary of land, buildings and equipment is presented in Table 6.

The operating costs of this winery were estimated at 65.8 cents per fifth. This is based on a conversion rate of 190 gallons of juice to a ton of muscadine grapes. This winery exhibited an 18 cents per fifth lower operating costs than Option A for small winery. More economical use of labor accounted for this reduction. It was assumed that the volume could be marketed in the state without having to capture an extremely large share of the North Carolina wine sales.

Overhead costs per unit were similar for the small and medium wineries since more expensive-higher capacity equipment for pressing, corking, etc., is feasible for this plant size. Capital in the form of more efficient equipment is substituted for labor used in the small plant. This is the primary reason for lower per unit labor costs in the medium winery.

Total operating and overhead costs amounted to 87.6 cents per fifth which is about 18 cents per fifth less than Option A for the small winery.

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<sup>4</sup>The tax rates for selected Southeastern states are the following: Arkansas-6¢/gal. on native, 75¢ on out-of-state; District of Columbia-15¢/gal.; Florida-23¢/gal. on native wine and \$1.15/gal. on out-of-state; Georgia-20¢/gal. on native and \$1.00/gal. on out-of-state; Kentucky-50¢/gal.; Louisiana-11¢/gal.; Maryland-20¢/gal.; South Carolina-45¢/gal. on native and \$1.08/gal. on out-of-state; Tennessee-\$1.16/gal.; Virginia-35¢ tax plus 15¢ mark-up on out-of-state wines. See Raymond J. Folwell and Richard T. Bailey. Will Rising Taxation Slow Down Table Wine Sales, Wines and Wines, September 1972.

Table 5. Estimated resource requirements and costs of producing pure muscadine wine in a 100,000 gallon winery (medium size winery - Option A)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes (190 gal./ton)	526 tons			
Bottles	500,000	200	105,200	.210
Bottle closures	500,000	.20 (printed carton)	100,000	.200
		.05 (capsules)	25,000	.050
<u>Labor</u>				
Winemaker			12,000	.024
Part-time labor			5,500	.011
Bookkeeping, office			<u>8,000</u>	<u>.016</u>
			25,550	.051
<u>Excise taxes</u>				
Federal	17¢ per gal.		17,000	.034
North Carolina	5¢ per gal.		<u>5,000</u>	<u>.010</u>
			22,000	.044
Sugar	24,000 lbs.	.20	24,000	.048
Utilities	\$300 per month		3,600	.007
Advertising and promotion			20,000	.040
Miscellaneous (chemicals, filter pads, etc.)			<u>4,000</u>	<u>.008</u>
Total operating costs			329,350	.658

Table 5 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<b>Overhead costs</b>			
<b>Capital outlay</b>			
Equipment	\$419,000 at 15 years	27,933	.056
Building	200,000 at 20 years	10,000	.020
Land	40,000	0	0
Subtotal	<u>\$659,000</u>	<u>37,933</u>	<u>.076</u>
Taxes	100% evaluation with tax rate of \$1 per \$100 value	6,590	.013
Insurance	1/2% equipment and building value	3,095	.006
Repairs and maintenance	2% equipment and building	12,380	.025
Interest			
Plant and equipment	5% of capital outlay	32,950	.066
Wine inventory	5% of total operating cost	<u>16,217</u>	<u>.032</u>
Total interest costs		49,167	.098
Total overhead costs		109,165	.218
Total operating and overhead costs		438,515	.876

Table 6. Summary of building and equipment requirements for a 100,000 gallon winery

Item	Size or capacity	Costs (\$)
<u>Land requirements</u>	10 acres	40,000
<u>Building requirements</u>		
Stemming and crushing shed	1,000 sq. ft.	7,000
Fermenting and tank room	8,000 sq. ft.	80,000
Bottling room	1,700 sq. ft.	17,000
Warehouse	3,000 sq. ft.	30,000
Bathrooms	150 sq. ft.	3,500
Office	300 sq. ft.	7,500
Tasting and retail sales room	600 sq. ft.	15,000
Air conditioning and cooling		<u>40,000</u>
Subtotal		200,000
<u>Equipment requirements</u>		
Stemmer crusher		2,000
Press		6,000
Pumps (must and transfer pumps)		4,000
Transfer lines (hose and fittings)		2,500
Stainless steel tanks (3/6" thick, 304 stainless steel) <sup>a</sup>		
Fermenting and storage	50,000 gal.	125,000
Storage and setting	<u>100,000 gal.</u>	<u>175,000</u>
Subtotal	150,000 gal.	300,000
Filter		3,000
Automatic bottler, corker and labeler		100,000
Miscellaneous equipment		<u>1,500</u>
Subtotal		419,000
Total land, building and equipment		659,000

<sup>a</sup> Additional storage capacity of \$40,000 was required for Option C.

Savings of this magnitude would enable an operator of this winery to exert considerable competitive pressure on the operator of the small winery.

#### Option B

Resource requirements and costs are summarized for this plant producing 100,000 gallons of blended wine (Table 7). Savings in operating costs of 6.9 cents relative to Option A of the medium winery are due to a reduction in raw product costs resulting from the blending. Savings of 16.9 cents over Option B of the small winery resulted primarily from labor efficiency in terms of lower costs per unit of output.

Overhead costs were around the 21 to 22 cents level. Combined overhead and operating costs were 80.7 cents per fifth gallon which represented a cost savings of about 7 cents over Option A of the medium size winery and 16.5 cents cost savings over Option B of the small size winery.

#### Option C

This option doubles the volume relative to Options A and B with relatively minor overhead capital outlays. Cost savings result from labor cost reductions, blending, and economies in capital outlay. The resource requirements and costs for this option are summarized in Table 8.

Operating costs were 54.2 cents per fifth gallon which are almost 5 cents less than operating costs for Option B and 12 cents lower than Option A. Overhead costs were only 12.6 cents per fifth which represented a cost savings of almost 10 cents per fifth gallon. Combined costs of 66.8 cents per fifth represented a reduction of 13.9 cents over Option B and a 20.8-cent reduction over Option A of this size winery.

### Large Winery

#### Option A

A summary of resource requirements and costs is presented in Table 9. A listing of land, buildings and equipment requirements is presented in Table 10. The winery with a capacity to produce within the plant about

Table 7. Estimated resource requirements and costs of producing blended wine in a 100,000 gallon winery (medium sized winery - Option B)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes	263 tons	200	52,600	.105
Bottles	500,000	.20 (printed carton)	100,000	.200
Bottle closures	500,000	.05 (capsules)	25,000	.050
Labor				
Winemaker			12,000	
Part-time labor			5,500	
Bookkeeping, office			<u>8,000</u>	
			25,500	.051
Excise taxes				
Federal	17¢ per gal.		17,000	
North Carolina	5¢ per gal.		<u>5,000</u>	
			22,000	.044
Sugar	60,000 lbs.	.20	12,000	.024
Utilities	\$300 per month		3,600	.007
Advertising and promotion			20,000	.040
Miscellaneous (chemicals, filter pads, etc.)			4,000	.008
Bulk wine	50,000 gals.	.60	<u>30,000</u>	<u>.060</u>
Total operating costs			294,700	.589



Table 7 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$419,000 at 15 years	27,933	.056
Building	200,000 at 20 years	10,000	.020
Land	40,000	0	0
Subtotal	\$659,000	37,933	.076
Taxes	100% evaluation with tax rate of \$1 per \$100 value	6,590	.013
Insurance	1/2% equipment and building value	3,095	.006
Repairs and maintenance	2% equipment and building	12,380	.025
Interest			
Plant and equipment	5% of capital outlay	32,950	.066
Wine inventory	5% of total operating cost	<u>16,217</u>	<u>.032</u>
Total interest costs		49,167	.098
Total overhead costs		109,165	.218
Total operating and overhead costs		403,865	.807

Table 8. Estimated resource requirements and costs of producing blended wine in a 100,000 gallon winery (medium size winery - Option C)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes	526 tons	200	105,200	.105
Bottles	1,000,000	.20 (printed carton)	200,000	.200
Bottle closures	1,000,000	.05 (capsules)	50,000	.050
Labor				
Winemaker			12,000	.012
Part-time labor			11,000	.011
Bookkeeping, office			<u>8,000</u>	<u>.008</u>
			31,000	.031
Excise taxes				
Federal	17¢ per gal.		34,000	.034
North Carolina	5¢ per gal.		<u>10,000</u>	<u>.010</u>
			44,000	.044
Sugar	124,000 lbs.	.20	24,000	.024
Utilities	\$300 per month		3,600	.004
Advertising and promotion			20,000	.020
Miscellaneous (chemicals, filter pads, yeast, etc.)			4,000	.004
Bulk wine	100,000 gals.		<u>60,000</u>	<u>.060</u>
Total operating costs			541,800	.542

Table 8 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$459,000 at 15 years	30,600	.031
Building	200,000 at 20 years	10,000	.010
Land	40,000	0	0
	<u>\$699,000</u>	<u>40,600</u>	<u>.041</u>
Taxes	100% evaluation with tax rate of \$1 per \$100 value	6,990	.007
Insurance	1/2% equipment and building value	3,295	.003
Repairs and maintenance	2% equipment and building cost	13,180	.013
Interest			
Plant and equipment	5% of capital outlay	34,950	.035
Wine inventory	5% of total operating cost	<u>27,090</u>	<u>.027</u>
Total interest costs		62,040	.062
Total overhead costs		126,105	.126
Total operating and overhead costs		667,905	.668

Table 9. Estimated resource requirements and costs of producing pure muscadine wine in a 500,000 gallon winery (large winery - Option A)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes (200 gal./ton)	2,500 tons	200	500,000	.200
Bottles	2,500,000	.19 (printed carton)	475,000	.190
Bottle closures and labels	100,000	.05 (capsules)	125,000	.050
Labor				
Winemaker			18,000	.007
Part-time labor			30,000	.012
Bookkeeping, office			<u>25,000</u>	<u>.010</u>
			73,000	.029
Excise taxes				
Federal	17¢ per gal.		85,000	.034
North Carolina	50% of sales at 5¢/gal.		12,500	.005
Other states	50% of sales at 60¢/gal.		<u>150,000</u>	<u>.060</u>
			247,500	.099
Sugar	600,000 lbs.	.20	120,000	.048
Utilities	1,000 per month		12,000	.005
Advertising and promotion			137,500	.055
Miscellaneous (chemicals, filter pads, etc.)			<u>10,000</u>	<u>.004</u>
Total operating costs			1,700,000	.680

Table 9 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$1,894,500 at 15 years	126,300	.051
Building	900,000 at 20 years	45,000	.018
Land	100,000	0	0
	<u>\$2,894,500</u>	<u>171,300</u>	<u>.069</u>
Taxes	100% evaluation with tax rate of \$1 per \$100 value	28,945	.012
Insurance	1/2% equipment and building value	13,972	.006
Repairs and maintenance	2% equipment and building	55,890	.022
Interest			
Plant and equipment	5% of capital outlay	144,725	.059
Wine inventory	5% of total operating cost	<u>85,000</u>	<u>.033</u>
Total interest costs		229,725	.092
Total overhead costs		499,832	.201
Total operating and overhead costs		2,199,832	.881

Table 10. Summary of land, building and equipment requirements for a 500,000 gallon winery

Item	Size or capacity	Costs (\$)
<u>Land requirements</u>	25 acres	100,000
<u>Building requirements</u>		
Stemming and crushing shed	5,000 sq. ft.	35,000
Fermenting and tank room	40,000 sq. ft.	400,000
Bottling room	3,500 sq. ft.	35,000
Warehouse	13,250 sq. ft.	132,500
Bathrooms	400 sq. ft.	10,000
Office	1,500 sq. ft.	37,500
Tasting and retail sales room	2,000 sq. ft.	50,000
Air conditioning and cooling		<u>200,000</u>
Subtotal		900,000
<u>Equipment requirements</u>		
Stemmer crusher		8,000
Press		30,000
Pumps (must and transfer)		10,000
Transfer lines (pipe and fittings)		15,000
Stainless steel tanks <sup>a</sup>		
Fermenting and storage	250,000 gal.	262,500
Storage and settling	<u>600,000 gal.</u>	<u>1,050,000</u>
Subtotal	850,000 gal.	1,612,500
Filters		10,000
Automatic bottler, corkers and labelers		200,000
Miscellaneous equipment		<u>9,000</u>
Subtotal		1,894,500
Total land, buildings and equipment		2,894,500

<sup>a</sup> Additional storage capacity of \$190,000 was required for Option C.

500,000 gallons of wine may run into market and tax problems. The entire volume could not likely be marketed within North Carolina at the favorable tax rate. Thus, it was assumed that 50 percent of the volume could be marketed in the state. The remainder would have to be marketed in other states at an assumed excise tax of 60 cents per gallon. Some states have higher tax rates, but it is not practical to specify allocations of wine sales among states.

A comparison of operating costs illustrates the effects of size due to discriminatory excise taxing by other states. The operating costs were almost 3 cents per gallon greater for this winery than for Option A of the medium size plant. This increase occurred even though the conversion rate was raised from 190 to 200 gallons of juice per ton of muscadine grapes. Excise taxes for this option were 9.9 cents per fifth for this option but only 4.4 cents for the medium size winery -- Option A. A cost reduction was reaped in labor utilization which tended to offset some of the additional costs of excise taxes.

The overhead costs were a couple cents per fifth less for this unit than for Option A of the medium size winery. Thus, the combined costs of 88.1 cents per fifth is slightly greater than total costs of Option A of the previous size unit. For all practical purposes, total costs were equal for this option for the two wineries although the volume of output increased fivefold.

### Option B

The output of this unit was equal to Option A but is a blended wine. A quantity of muscadine grapes required by this option is 1,250 tons or 50 percent as large as Option A. Resources required and costs are presented in Table 11.

Operating costs amounted to 61.6 cents per fifth which is 6.4 cents per fifth less than these costs for Option A. This difference results from the savings in blending operations.

Overhead costs plus operating costs totaled 81.4 cents per gallon. The blending operation resulted in savings over Option A of 6.7 cents per fifth. The effects on product quality of blending are not considered in costs. Product quality changes would be expected to affect revenues rather than costs.

Table 11. Estimated resource requirements and costs of producing blended wine in a 500,000 gallon winery (large winery - Option B)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes	1,250 tons	200	250,000	.100
Bottles	2,500,000	.19 (printed carton)	475,000	.190
Closures & labels	2,500,000	.05 (capsules)	125,000	.050
Labor				
Winemaker			18,000	.007
Labor			30,000	.012
Bookkeeping office			25,000	.010
			<u>73,000</u>	<u>.029</u>
Excise taxes				
Federal	17¢ per gal.		85,000	.034
North Carolina	50% of sales at 5¢/gal.		12,500	.005
Other states	50% of sales at 60¢/gal.		<u>150,000</u>	<u>.060</u>
			247,500	.099
Sugar	300,000 lbs.	.20	60,000	.024
Utilities	1,000 per month		12,000	.005
Advertising and promotion			137,500	.055
Miscellaneous (chemicals, filter pads, etc.)			10,000	.007
Bulk wine	250,000 gals.	.60	<u>150,000</u>	<u>.060</u>
Total operating costs			1,540,000	.619



Table 11 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$1,894,500 at 15 years	126,300	.051
Building	900,000 at 20 years	45,000	.018
Land	<u>100,000</u>	<u>0</u>	<u>0</u>
Subtotal	\$2,894,500	171,300	.069
Taxes	100% evaluation with tax rate	28,945	.012
Insurance	1/2% equipment and building costs	13,973	.006
Repairs and maintenance	2% equipment and building costs	55,890	.022
Interest			
Plant and equipment	5% of capital outlay	144,725	.058
Wine inventory	5% of total operating cost	<u>77,000</u>	<u>.031</u>
Total interest costs		221,725	.089
Total overhead costs		491,833	.198
Total operating and overhead costs		2,031,833	.817

### Option C

A summary of resource requirements and costs for Option C is presented in Table 12. The effects of higher excise taxes for out-of-state sales are readily apparent. Operating costs were almost 2 cents more per fifth gallon than for Option B.

Overhead costs were 7.7 cents per fifth less than the previous option. As a result, operating costs totaled 75.5 cents per fifth for a total cost savings of 5.9 cents per fifth over Option B and 18.5 cents per fifth over Option A for the large plant.

### Combining In-Plant and Other Costs

The last few sections presented a rather detailed view of in-plant winery costs. However, the operation of a winery does not stop at the winery warehouse. The profitability of a winery operation depends on how acceptable the product is to the wine consumer. Acceptability of a product depends to a considerable degree on its price relative to prices of substitute products. The degree of product substitutability is also an important factor. The purpose of this analysis is not to measure product acceptability. It is assumed that either a pure muscadine wine or a blended muscadine wine would compete with wines from other grape producing areas at some relative prices. The purpose of this section is to provide an estimate of minimum retail prices. This is done by starting at the base at-plant values and adding transportation, wholesale, distribution and retail costs.

Data on costs of transportation, wholesale and retail were obtained from local wholesale distributors. These distributors usually provide the accounting services involved in paying for shipping costs and marking retail prices as instructed by the retailer.

In Table 13, these costs are summarized for the three wineries and their three options. Minimum consumer prices are presented in the last column. It is considered minimum because no allowances (economic rent or profit) for risk, entrepreneurship, etc., are included for the processor.

The effects of volume, blending and discriminatory excise taxes are readily apparent from these data. The effects of volume and conversion rate can be observed by comparing the costs of a given

Table 12. Estimated resource requirements and costs of producing blended wine in a 500,000 gallon winery (large winery - Option C)

Item	Description	Values (\$/unit)	Total costs (\$)	Average costs (\$/1/5 gal.)
<u>Operating costs</u>				
Grapes	2,500 tons	200	500,000	.100
Bottles	5,000,000	.19 (printed carton)	950,000	.190
Closures & labels	5,000,000	.05 (capsules)	250,000	.050
Labor				
Winemaker			18,000	.004
Labor			55,000	.011
Bookkeeping office			<u>40,000</u>	<u>.008</u>
			113,000	.023
Excise taxes				
Federal	17¢ per gal.		170,000	.034
North Carolina	50% of sales at 5¢ per gal.		12,000	.003
Other states	75% of sales at 60¢ per gal.		<u>450,000</u>	<u>.090</u>
			732,500	.127
Sugar	600,000 lbs.	.20	120,000	.024
Utilities	1,200 per month		14,400	.003
Advertising and promotion			275,000	.055
Miscellaneous (chemicals, filters, yeast, etc.)			12,000	.002
Bulk wine	500,000 gal.	.60	<u>300,000</u>	<u>.060</u>
Total operating cost			3,166,900	.634

Table 12 (continued)

Item	Description	Annual costs	
		Total (\$)	Average (\$/1/5 gal.)
<u>Overhead costs</u>			
Capital outlay			
Equipment	\$2,084,500 at 15 years	138,967	.028
Building	900,000 at 20 years	45,000	.009
Land	100,000	0	0
Subtotal	\$3,084,500	183,967	.037
Taxes	100% evaluation with tax rate \$1 per \$100 value	30,845	.006
Insurance	1/2% equipment and building value	15,422	.003
Repairs and maintenance	2% equipment and building costs	61,690	.012
Interest			
Plant and equipment	5% of capital outlay	154,225	.031
Wine inventory	5% of total operating costs	158,345	.032
Total interest costs		312,570	.063
Total overhead costs		604,494	.121
Total operating and overhead costs		3,771,394	.755

Table 13. Summary of volumes, costs and consumer prices for three wineries with three operating options

Winery and option	Raw muscadine grapes <sup>a</sup> (tons)	Blend wine <sup>b</sup> (1,000 gal.)	Sales volume		Initial capital outlay (1,000 dol.)	Variable costs	Overhead costs	Total processing costs	Transportation costs	Distribution costs <sup>c</sup>	Retailing costs <sup>d</sup>	Minimum consumer price <sup>e</sup>
			Muscadine	Blend								
			(1,000 fifths)		(dollars per fifth)							
<u>Small</u>												
Option A	111	0	100	0	124	.84	.21	1.05	.04	.27	.48	1.84
Option B	56	10	50	50	124	.76	.21	.97	.04	.25	.44	1.70
Option C	111	20	100	100	144	.66	.13	.79	.04	.21	.36	1.40
<u>Medium</u>												
Option A	526	0	500	0	659	.66	.22	.88	.06	.24	.41	1.59
Option B	263	50	250	250	659	.59	.22	.81	.06	.22	.38	1.47
Option C	526	100	500	500	699	.54	.13	.67	.06	.18	.32	1.23
<u>Large</u>												
Option A	2,500	0	2,500	0	2,894.5	.68	.20	.88	.08	.24	.42	1.62
Option B	1,250	250	1,250	1,250	2,894.5	.62	.20	.82	.08	.23	.40	1.53
Option C	2,500	500	2,500	2,500	3,084.5	.63	.12	.75	.08	.21	.36	1.40

<sup>a</sup> Assumes a conversion rate of 180 gallons per ton for the small plant, 190 gallons per ton for the medium plants and 200 gallons per ton for the large plant. Grape price was set at \$200 per ton.

<sup>b</sup> Blend wine price was set at 60 cents per gal.

<sup>c</sup> Estimated at 25 percent of total processing and transportation costs.

<sup>d</sup> Estimated at 35 percent of total processing, transportation and distribution costs.

<sup>e</sup> Minimum consumer price is so labeled because no economic rents are included at the processing level.

option for the small and medium plants. The largest plant should not be considered directly in the comparison since it incorporates both the effects of discriminatory excise taxes and volume and conversion rate effects.

The minimum retail price for Option A is \$1.59 for the medium winery. The advantage of the medium plant over the small plant is 25 cents per fifth. This is a sizeable competitive disadvantage for small plant operators to overcome if the wine quality is equal for the two wineries. The combined effects of volume and excise tax for the large plant were negative when compared to the medium plant size. However, the 3-cent disadvantage for Option A-large winery could be offset by a successful effort to capture the in-state market for wine. The large plant-Option A still exhibited considerable economies relative to the small winery-Option A. A 22-cent advantage held by the large plant would also place the small plant in a difficult competitive position.

The medium size winery had a 23-cent competitive advantage over the small winery and a 6-cent advantage over the large winery for Option B. The advantage declined to 17 cents over the small winery but increased to 17 cents over the large winery for Option C. The gain over the large winery resulted from the effects of differential excise taxes.

The effects of blending can be detected by comparing Options A and B within a given winery. For example, blending gave Option B a 14-cent advantage over Option A for the small winery. The 44-cent advantage of Option C over Option A within the small plant represented the combined effects of blending and volume effects. Option C produced twice as much wine as Option A.

Blending resulted in a 12-cent advantage for Option B over Option A for the medium size winery. The margin fell to 9 cents for these two options when considering the large winery.

The preceding sections presented an analysis of winery opportunity from a cost accounting approach. The following sections will look at the investment opportunities by calculating and comparing internal rates of return at predetermined at-plant prices and planning horizons. Internal rates of return will be defined later.

## INVESTMENT ANALYSIS USING THE CAPITALIZATION APPROACH

### The Data Base and Assumptions

#### The Estimating Equation

An investor is interested in the profitability of wine operations relative to the profitability of other alternative investment opportunities. It is beyond the scope of this analysis to do an extensive analysis of other alternatives. The profitability of a winery in terms of the expected returns to capital will be provided so that the investor can make a comparison of capital returns and capital costs. The indicator used for this purpose is referred to as the internal rate of return to capital. The internal rate of return is defined as the interest rate which equates the present value of the total revenue stream to the present value of the total cost stream. In other words, it is the interest rate that yields a zero present value of the net revenue stream. In the case of the winery operation, the following expression will be equated to zero by varying the interest rate:

$$P_{\text{VNR}} = C_0 + \frac{R_1 - C_1}{1 + i} + \frac{R_2 - C_2}{(1 + i)^2} + \dots + \frac{R_n - C_n}{(1 + i)^n} + \frac{S_n}{(1 + i)^n} = 0$$

where

$P_{\text{VNR}}$  = present value of a net increase stream;

$C_0$  = initial capital outlay in present time period;

$R_j$  = annual expected revenue in the  $j^{\text{th}}$  year;

$C_j$  = annual expected cost in the  $j^{\text{th}}$  year;

$S_n$  = salvage value of the operation in year  $n$ ;

$i$  = interest rate;

$j = 1, 2, \dots N - 1;$

$N =$  year ending the planning horizon.

The general decision rule for using the internal rate of return is to select the investment alternatives which yield the greatest internal rates of return. Profitable investments can continue with unlimited owned or borrowed capital resources as long as the internal rate of return on the marginal unit is equal to or greater than the opportunity costs of capital.

The solution to the above equation requires data on initial capital outlay, the streams of annual costs and returns, and the planning horizon. The preceding discussion of costs provides data for generating the cost streams and the initial capital outlays. The following sections present the bases for these and other input data.

#### Initial Capital Outlay and Cost Stream

The costs of buildings, equipment and land were developed and presented in the tables of the preceding sections. The accuracy of these values is very critical but it is difficult to estimate the value of land if a location has not been selected. Buildings and equipment costs are dependent on site but not as directly as land costs. The relative importance of land was not considered great enough to warrant sensitivity analysis. An investor with a specific site and its value should be able to make the adjustment.

Costs of producing wine which are useful in determining internal rates of return include operating costs and overhead costs excluding depreciation and interest on the initial capital outlay. Depreciation is omitted because it is covered by the initial capital outlay and salvage value. Interest is omitted because the capitalization process in effect determines the interest rate and expresses it as an internal rate of return.

Costs of producing wine would be expected to vary over time due to inflation, shifts in grape supply due to weather, etc. It is difficult to specify these changes. These changes would not be expected to affect the internal rates of return if proportional changes occur in costs and



wine receipts. Inflationary effects would tend to be proportional but the supply of grapes could vary without proportionate changes in receipts since supplies of grapes in other areas may not be so affected by weather and other local elements. For this analysis, costs are assumed to remain unchanged over the planning horizon.

Many investment analyses provide internal rates of return before income taxes. Before income tax, internal rates of return are useful for planning and will be provided in this report. After income tax rates of return serve another purpose and will also be presented. In the cost tables discussed previously, income taxes for wine operations were considered to be zero because no taxable income was generated in the cost accounting process. However, when cost and revenue streams as presented below are combined, taxable income would likely be generated. A corporate income tax schedule was developed to estimate these taxes.

The federal rates used were 20 percent of taxable income for less than \$25,000; 22 percent for taxable income falling between \$25,000 and \$50,000; and 48 percent of taxable income over \$50,000. The state corporate tax rate was set at 6 percent of taxable income. Taxable income included allowances for depreciation and the carry-over of losses in income.

#### Income Stream (R.<sub>j</sub>)

The income stream is composed of sales of the previous year's output and the salvage value of the winery at the end of the planning horizon. As mentioned above, receipts would be affected by inflation, changes in consumers' tastes, etc., but it is impractical to attempt to project changes in annual receipts. Thus, two basic at-plant prices were selected for generating income stream projections.<sup>5</sup> These were

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<sup>5</sup> Many small wineries in other states market a significant percentage of their production from at-plant sales. With at-plant sales, a winery is able to demand a higher price than sales to distributors. Usually at-plant sales do not increase the small wineries' labor costs because of the need for a winemaker and office help to be at the

\$1.10 and \$1.15 per fifth gallon. An alternative price of 80 cents per fifth was considered for the medium and large plants.

There is a question about the availability of a market for table wines at the above prices. Data are not available to estimate the price-quantity relationship for muscadine and blended muscadine wines. In Table 14, consumption trends for wines for North Carolina, Georgia, Florida and the District of Columbia are presented. Data for South Carolina and Virginia are available for latter years for all wines. An analysis of recent trends does suggest that wine consumption in North Carolina and several of the southeastern states has been increasing. These data also illustrate the trend from the higher alcoholic wines (> 14 percent) or dessert to the lower alcoholic wines (< 14 percent) which are usually referred to as table type wines. Muscadine wines are usually marketed as low alcoholic wines but the dessert or higher alcoholic wines can be made from muscadine grapes by fortification. The products considered in this study are the unfortified wines.

The consumption as measured by volume entering distribution channels of wines in North Carolina has been growing but table wines have been growing more rapidly than the dessert wines. In fact, North Carolina is the only state in the southeast with available data which has not shown a rather sharp drop in dessert wine consumption. Total wines of both types entering market channels in North Carolina amounted to more than 6.6 million gallons in 1975. However, the market share of North Carolina probably should be based on the 3.6 million gallons of table wine. The largest plant with Option C would contribute about 14 percent of the 1975 North Carolina table wine marketings. The other options for the large plant and the small and medium plants would represent a much smaller market share. Option C of the small plant would contribute only 1.1 percent of North Carolina consumed wine.

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winery most of the day. In California and New York, there are wineries which market up to 100 percent of production by on-premise sales.

North Carolina grape growing region is in a relatively unpopulated area. Thus it is difficult to estimate the potential for at-plant sales. The prices used in this analysis are prices paid to the winery by distributors.

Table 14. Volumes of wine entering distribution channels by type of wine for selected southeastern states, 1966-1975

Year	State <sup>a</sup>								
	North Carolina		Georgia		District of Columbia		Florida		South Carolina
	< 14%	> 14%	< 14%	> 14%	< 14%	> 14%	< 14%	> 14%	All wines
	(1,000 gallons)								
1966	438	2,095	390	1,618	886	1,506	2,235	3,734	NA
1967	474	1,889	473	1,684	1,013	1,532	2,539	3,733	NA
1968	530	1,958	649	1,688	1,064	1,339	2,998	3,970	NA
1969	930	2,212	1,192	1,642	1,315	1,260	3,837	4,086	NA
1970	1,346	2,346	1,179	1,695	1,505	1,198	4,847	4,010	1,703
1971	2,182	2,491	1,625	1,010	1,913	1,117	7,222	3,081	2,058
1972	2,914	2,804	2,361	1,396	2,286	1,045	10,151	1,891	2,613
1973	2,883	2,763	2,742	1,229	2,518	919	11,960	1,439	2,653
1974	2,972	2,805	2,926	942	2,453	841	12,034	1,381	2,739
1975	3,592	3,093	3,356	942	2,552	820	12,857	1,596	3,147

<sup>a</sup>Virginia data were available for all wines during 1974 and 1975. These were 5,807 thousand gallons in 1974 and 6,703 thousand gallons in 1975.

Source: Wine Industry Statistical Report, 1975, The Wine Institute, San Francisco, California, April 15, 1976.

The salvage value of the winery ( $S_n$ ) also enters as a component of the income stream. The value of the winery at the end of the planning period is difficult to estimate because of the obsolescence problem and the status of the product in the market place. The value set on the salvage sale does affect the internal rate of return. The approach used here was to assume no capital appreciation on buildings and equipment. Land was permitted to appreciate. The salvage value schedule adopted is as follows:

- a. Buildings - 50 percent of initial costs.
- b. Equipment - 33 percent of initial costs.
- c. Land - 150 percent of purchase price.

#### Planning Horizon (N)

The rate of return is dependent on the length of the planning period. In a discounting procedure, the earlier years are critical since they receive a disproportionate weight. As the planning horizon lengthens, additional years are available for discounting. Additions to the discounted revenue streams through adding years are partly offset by a declining salvage value of the unit.

Technological obsolescence is another factor important in determining the length of the planning horizon. It is difficult if not impossible to project when a new method or technology may be developed which would render the current technology economically obsolete.

The time lags in building the plant, producing the first run of wine and marketing the first batch further complicate the problem of specifying the time horizon. With these factors in mind, however, a planning horizon of 12 years was selected. This represents planning the building and setting up the winery during year 1. The second year involves producing the first batch of wine. Sales of year 1 production would begin in year 2. This process would continue for 10 years and would terminate in year 12 with the sale of the eleventh year's production and the sale of the winery.

### Internal Rates of Return

The internal rates of return for three product prices are presented in Table 15. The numbers in parentheses are internal rates of return after income taxes, based on corporate schedule, are deducted. The small plant-Option A did not yield a positive internal rate of return for any of the three product prices. Option B for the small plant yielded a negative internal rate of return for all prices except the \$1.15 per fifth before taxes. Yet, a 5 percent earning on before-tax income would not be competitive for the use of capital when the prime interest rate is 7 to 9 percent. It is doubtful that any of the winery operations would qualify for prime interest rates.

The small winery-Option C yielded a competitive rate of return to capital for the two highest product prices.<sup>6</sup> This option blended bulk wine with muscadine wine and the volume was twice that of Option A and B.

The medium winery-Option A (100,000 gallon pure muscadine wine) yielded a 12 and 15 percent before-tax return for the \$1.10 and \$1.15 at-plant prices, respectively. Blending for Option B increased the rates before taxes by 4-5 percent and after taxes by 3 percent. Blending and doubling the volume as in Option C of the medium winery increased the before-tax rates of return by 19 percent at the \$1.10 price and 20 percent at the \$1.15 price. The 11 percent before-tax rate at the 80-cent price might be considered competitive by some investors.

The rates of return for the large size plant were similar to the medium size plant at Options A and B. Reduction in profitability was for Option C in which the rate of return dropped by about 5 percent. The reason for this decline stems from the additional cost of excise taxes involved in marketing wines in other states. The negative effects of the excise tax were greater than the volume and blending effects derived by Option C.

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<sup>6</sup>Competitive rate of return is considered to be one greater than the opportunity cost of capital, i.e., approximately 2 percent above the prime interest rate.

Table 15. Internal rates of return by winery, winery option, alternative prices and two income tax options

Plant and option	Internal rates of return at selected at-plant \$/fifth prices		
	.80	1.10	1.15
	(percent)		
<u>Small</u>			
Option A	N (N)	N (N)	N (N)
Option B	N (N)	N (N)	05 (N)
Option C	N (N)	18 (14)	22 (16)
<u>Medium</u>			
Option A	N (N)	12 (08)	15 (10)
Option B	N (N)	16 (11)	19 (13)
Option C	11 (07)	31 (20)	35 (23)
<u>Large</u>			
Option A	N (N)	13 (08)	15 (09)
Option B	N (N)	17 (10)	19 (12)
Option C	N (N)	26 (16)	29 (18)

N = negative internal rate of return.

( ) = internal rates of return after income tax deductions.

The blending of wines for the medium and large wineries positively affected the internal rates of return before taxes by about 4 percent. This is measured by comparing the rates for Options A and B. The effects of volume can also be measured for the medium size winery. The volume effects by this method on the initial rate of return would be about 15 percent. Thus, the economies of blending and volume on the rate of return total around 19 percent. If the difference is similar for the large winery, the negative effective of excise tax involved in out-of-state sales can be estimated at about 6 percent.

#### SUMMARY AND CONCLUSIONS

The purpose of this study was to provide information concerning the profitability of grape processing into wine. Three wineries with three potential operating options were considered. Two approaches were used to quantify the profitability of wineries. The first was an accounting of costs of overhead and operations. The second involved calculating internal rates of return to capital invested.

A summary of the results of using the first approach is presented in Figure 1. The value of the muscadine grape is relatively small, e.g., 11 percent for Option A but only 6 percent for Option B. This is calculated at a price of \$200 per ton of grapes.

Economies of blending are apparent as the total value of a fifth of wine in the small winery is \$1.86 per fifth for non-blending (Option A) but only \$1.70 per fifth for blending (Option B). The economies of volume can be noted by comparing Option A for the small and medium plants. The costs fell to \$1.59 per fifth as the volume increased from 20,000 gallons for the small winery to 100,000 gallons for the medium winery.

The effects of volume can be noted when the volume exceeds the quantity marketable in North Carolina where a preferential excise tax exists for wines produced from North Carolina grapes. It is apparent that taxes are an important component in the costs of operating a winery.

The second approach of estimating internal rates of return provided evidence of winery profitability. It indicated that the small winery could be considered feasible only if the at-plant price of wine was at least \$1.10 per fifth and the through-put reached 40,000 gallons by

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- 1. Value of muscadine grapes
- 2. Value of other operating costs
- 3. Value of overhead costs
- 4. Transportation and distribution costs
- 5. Retail costs
- S = Small plant
- M = Medium plant
- L = Large plant
- A, B, C, = operating options.

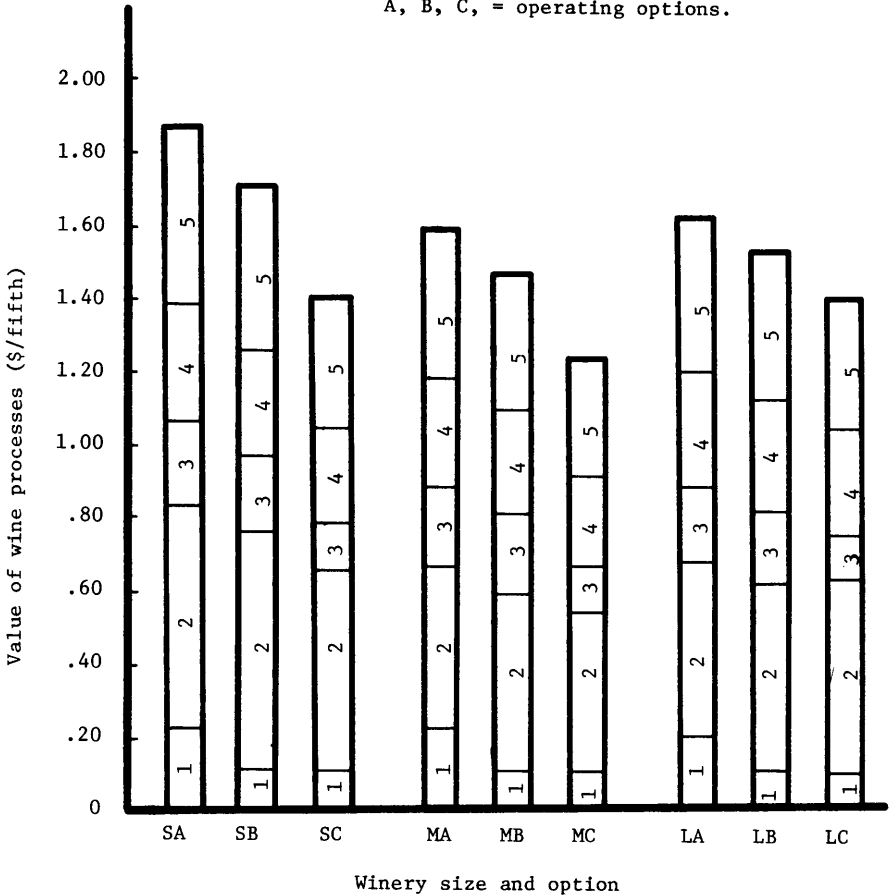


Figure 1. Distribution of costs or values of processes in a fifth of wine



blending. The medium winery was more profitable than either the small or large winery. The most profitable option was C of the medium size. This plant blended muscadine wine with bulk wine for a volume of 200,000 gallons. All the output was charged an in-state preferential excise tax.

This analysis was made under some assumptions which may not be valid under many conditions. For example, the winery was assumed to be operated at the volume for which it was designed. The lack of grapes or an exceedingly large inventory of wines could invalidate this assumption. This problem may not be too serious since overhead costs do not comprise a very large share of the total value of the final product.

Another problem which arises is that only a limited number of resource and final product prices are evaluated. The profitability is not considered to be too sensitive to changes in absolute prices since resource and product prices tend to change in the same direction and magnitude.

The problem in forecasting market demand and prices of the output needs to be resolved by the individual investor. Projections of market shares are important, but only the investor can determine how market promotion and sales will be handled. On-premise sales present another aspect which must be evaluated once the winery site is selected. These and other potential problems need further analyses.

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